REMARKS

The rejection of Claims 1-5 under 35 U.S.C. § 102(e) as anticipated by U.S. 6,642,165 (Miyashita et al), is respectfully traversed.

Miyashita et al discloses a wear resistant member for electronic equipment comprising a silicon nitride sintered body containing particles of conductivity enhancer and having electrical resistivity in the range of from 1 to 10^5 $\Omega \cdot m$ (same as 10^2 to 10^7 ohm·cm), which silicon nitride sintered body comprises agglomerations of the particles of conductivity enhancer in which distances between the respective particles of conductivity enhancer are less than 1 μm, the agglomerations of the particles of the conductivity enhancer being present in the range of 30% or less by area ratio per unit area in the silicon nitride sintered body (column 3, lines 9-19). Miyashita et al discloses further that the particles of conductivity enhancer are preferably at least one compound selected from carbides and nitrides of 4A, 5A, 6A and 7A group elements in the periodic table, silicon and boron, wherein carbides of tantalum (Ta), titanium (Ti), niobium (Nb), tungsten (W), silicon (Si) and boron (B) are preferably used (column 3, lines 20-28). While Miyashita et al thus discloses that the conductivity enhancer may include more than one compound, all the examples therein employ only one such compound. See, for example, Table 4 (column 26). Clearly, Miyashita et al recognizes no benefit in using a combination of two or more compounds, let alone the particular combination of the present claims, as now discussed.

As recited in Claim 1, the present invention is a silicon nitride wear resistant member comprised of a ceramic sintered body comprising 55 to 75 mass% of silicon nitride, 12 to 28 mass% of silicon carbide, 3 to 15 mass% of at least one element selected from the group consisting of Mo, W, Ta, and Nb in terms of silicide thereof, and 5 to 15 mass% of grain boundary phase comprised of a rare earth element-Si-Al-O-N, wherein the wear resistant

member has an electrical resistance of 10^7 to 10^4 Ω·cm, a porosity of 1% or less, and a three point bending strength of 900 MPa or more.

Thus, the present invention requires both a silicon carbide and a silicide of at least one of Mo, W, Ta, and Nb.

The importance of, and superiority obtained by, the use of such a combination is demonstrated by the comparative data in the specification herein.

In a first set of comparative data Example 1, as described at page 21, line 15ff, is according to the present invention. Comparative Examples 1-3, as described at page 22, line 17ff, are identical to Example 1, except that the SiC and Mo_2C are omitted in Comparative Example 1; only Mo_2C is omitted in Comparative Example 2; and only SiC is omitted in Comparative Example 3. The examples and comparative examples were subjected to various tests as described at page 23, line 5ff. The data is shown in Table 1 at page 25, which data show that only Example 1 produced an electrical resistance within the terms of the present claims.

In a second set of comparative data, the materials used in above examples and comparative examples, described as Example 1B and Comparative Examples 1B to 3B, respectively, as described at page 26, line 5ff, spherical primary molded bodies were obtained, and crushing strength, rolling fatigue life, and defects by static electricity were measured. As the data in Table 2 at page 28 shows, only Example 1B resulted in no defects by static electricity. The crushing strength for the example was also superior to that of the comparative examples.

In a further set of comparative examples, Examples 2-20 are analogous to above-discussed Example 1, but vary the relative amounts of the components and also employ elements other than Mo from the "at least one element" Markush group. Comparative Examples 4-10 use the same components as in the present invention, but in amounts outside

the amount ranges recited in Claim 1. Similarly, materials used in the same examples and comparative examples, labeled as Examples 2B to 20B and Comparative Examples 4B to 10B, respectively, are analogous to the above-discussed comparison of Example 1B and Comparative Examples 1B to 3B. The results for these examples and comparative examples are shown in Table 3 (Examples 2-20 and Comparative Examples 4-10) at page 31 and Table 4 (Examples 2B-20B and Comparative Examples 4B-10B) at page 34. A copy of Tables 3 and 4 is **attached herewith**.

Applicants describe the data in Table 3 at page 32, lines 1-19 as follows:

> As is clear from the results shown in Table 3, in the case of the wear resistant members of the respective Examples, which were formed by addition of predetermined amounts of the rare earth elements, and the silicon carbide powder and the molybdenum carbide powder as electroconductivity rendering particles, and so forth, could be rendered a predetermined electric resistance at which the retention of static electricity can be prevented. Moreover, the generation of pores could be suppressed. The mechanical strength characteristic was high, and the rolling fatigue life exceeded 1×10^7 cycles. Thus, the silicon nitride type wear resistant members having a superior durability could be produced.
>
> On the other hand, as shown in Comparative Examples 4 to 10, in the case of the sintered bodies in which the addition amounts of the electro-conductivity rendering particles, the rare earth element components, and so forth departed from the preferred range according to the present invention, the rolling lives of the surfaces the wear resistant members were short. Thus, it was ascertained that one of the characteristics, i.e., the electric resistances, the three point strengths, the fracture toughness of the sintered bodies, and so forth could not meet the requirements for the characteristics specified according to the present invention.

Applicants describe the results in Table 4 at page 35, lines 1-19, reproduced below:

> As is clear from the results shown in Table 4, in the case of the wear resistant members of the respective Examples, which were formed by addition of the predetermined amounts of the rare earth elements, and the silicon carbide powder and the molybdenum carbide powder as electroconductivity rendering particles, and so forth, could be rendered a

> predetermined electric resistance at which the retention of static electricity can be prevented. Moreover, the generation of pores was suppressed. The crushing strength was superior, and the rolling (fatigue) life exceeded 400 hours. Thus, the silicon nitride type wear resistant members having a superior durability could be produced.
>
> On the other hand, as shown in Comparative Examples 4B to 10B, regarding the sintered bodies in which the addition amounts of the electroconductivity rendering particles, the rare earth element components, and so forth departed from the preferred ranges specified in the present invention, it was found that the rolling (fatigue) lives of the rolling balls were short as a whole, or one of the characteristics of the crushing strength, the defects occurring due to the static electricity, and so forth of the sintered bodies could not meet the requirements for the characteristics specified according to the present invention, although the sintering operation and the HIP treatment were carried out under the same conditions as in the Example.

The above-discussed comparative data shows the importance of both the silicon carbide component and the at least one element ... in terms of silicide component being present, **and** the percentage ranges for the respective components. Miyashita et al recognizes neither of these characteristics.

In addition, Examples 9 and 9B show that comparable superior properties, including a porosity as low as 0.2%, can be achieved even without hot isostactic pressing (HIP) treatment. HIP is known to be costly both in terms of operating and labor. Miyashita et al uses HIP sintering to make their exemplary moldings (column 22, lines 20-24). While Miyashita et al are not restricted to HIP sintering, it is preferred (column 20, lines 45-60).

For all the above reasons, it is respectfully requested that the rejection over Miyashita et al be withdrawn.

The rejection of Claims 1-5 under 35 U.S.C. § 112, second paragraph, and the recital of the term "one element selected from the group ... in terms of silicide", is respectfully traversed. As described at page 11, lines 14-22, in processes for making the presently-claimed silicon nitride wear resistant member, members of the at least one element Markush

group of Claim 1 may be in the form of compounds other than silicides when present as starting materials, but are converted to silicides as a result of the various process steps. Thus, while the at least one element may also be present in the member as a non-silicide compound, must at least be present as a silicide compound in the recited amount range. Accordingly, it is respectfully requested that this rejection be withdrawn.

All of the presently pending and active claims in this application are now believed to be in immediate condition for allowance. The Examiner is respectfully requested to rejoin method claims of even scope, and in the absence of further grounds of rejection, pass this application to issue with all active and rejoined claims.

Respectfully submitted,

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